

AMENDMENTS TO THE CLAIMS

Listing of Claims:

This Listing of Claims will replace all prior versions, and listings, of claims in the application:

1-17 (Cancelled)

18. (Currently Amended) An apparatus comprising:

a) a reaction chamber containing a template comprising an unknown nucleic acid molecule attached to an immobilization surface;

b) an inlet channel in fluid communication with the reaction chamber;

c) an outlet channel in fluid communication with the reaction chamber;

wherein the first and second channels are distinct and separate from the reaction chamber and positioned before and after the reaction chamber;

d) a first Raman detection unit operably coupled to the inlet channel and configured to perform surface enhanced Raman spectroscopy (SERS); and

e) a second Raman detection unit operably coupled to the outlet channel at a location outside the reaction chamber and configured to perform surface enhanced Raman spectroscopy (SERS), wherein the second Raman detection unit is configured to measure the concentrations of nucleotides by Raman spectroscopy at a location outside the reaction chamber as the nucleotides flow through the outlet channel;

wherein the first and second Raman detection units are distinct and separate from the reaction chamber and are positioned before and after the reaction chamber.

19. (Previously Presented) The apparatus of claim 18, wherein each Raman detection unit is capable of detecting at least one nucleotide at the single molecule level.
20. (Previously Presented) The apparatus of claim 18, wherein the concentrations of nucleotides is measured by Raman spectroscopy as they flow through the inlet channel and outlet channel.
21. (Previously Presented) The apparatus of claim 18, further comprising SERS active metal nanoparticles in the inlet channel and outlet channel.
22. (Previously Presented) The apparatus of claim 18, wherein the inlet channel and outlet channel diameter is between about 100 and about 200 micrometers in diameter.
23. (Currently Amended) The apparatus of claim 18, further comprising a mesh inside the outlet channel, the mesh ~~SERS active metal nanoparticles~~ comprising silver, gold, platinum, copper or aluminum.
- 24-35 (Cancelled)
36. (Currently Amended) An apparatus comprising:

- a) a reaction chamber containing a template comprising an unknown nucleic acid molecule attached to an immobilization surface;
- b) an inlet channel in fluid communication with the reaction chamber;
- c) an outlet channel in fluid communication with the reaction chamber;
wherein the first and second channels are distinct and separate from the reaction chamber and positioned before and after the reaction chamber;
- d) a first Raman detection unit operably coupled to the inlet channel, wherein surface enhanced Raman spectroscopy (SERS) active particles are in the inlet channel; and
- e) a second Raman detection unit operably coupled to the outlet channel at a location outside the reaction chamber, wherein SERS active particles are in the outlet channel,
wherein the second Raman detection unit is configured to measure the concentrations of nucleotides by Raman spectroscopy at a location outside the reaction chamber as the nucleotides flow through the outlet channel;
wherein the first and second Raman detection units are distinct and separate from the reaction chamber and are positioned before and after the reaction chamber.

37. (Previously Presented) The apparatus of claim 36, wherein each Raman detection unit is capable of detecting at least one nucleotide at the single molecule level.

38. (Previously Presented) The apparatus of claim 36, wherein the concentrations of nucleotides is measured by Raman spectroscopy as they flow through the inlet channel and outlet channel.

39. (Previously Presented) The apparatus of claim 36, wherein the inlet channel and outlet channel diameter is between about 100 and about 200 micrometers in diameter.

40. (Currently Amended) The apparatus of claim 36, further comprising a mesh inside the outlet channel, the mesh SERS-active metal-nanoparticles comprising silver, gold, platinum, copper or aluminum.

41. (Currently Amended) An apparatus comprising:

a) a reaction chamber containing a template comprising an unknown nucleic acid molecule attached to an immobilization surface;

b) an inlet channel in fluid communication with the reaction chamber;

c) an outlet channel in fluid communication with the reaction chamber;

wherein the first and second channels are distinct and separate from the reaction chamber and positioned before and after the reaction chamber; and

d) a Raman detection unit operably coupled only to the outlet channel at a location outside the reaction chamber and configured to perform surface enhanced Raman spectroscopy (SERS), wherein the second Raman detection unit is configured to measure the concentrations of nucleotides by Raman spectroscopy at a location outside the reaction chamber as the nucleotides flow through the outlet channel;

wherein the Raman detection unit is distinct and separate from the reaction chamber and is positioned after the reaction chamber.

42. (Currently Amended) The apparatus of claim 41, wherein each the Raman detection unit is capable of detecting at least one nucleotide at the single molecule level.

43. (Previously Presented) The apparatus of claim 41, wherein the concentrations of nucleotides is measured by Raman spectroscopy as they flow through the inlet channel and outlet channel.

44. (Previously Presented) The apparatus of claim 41, wherein the inlet channel and outlet channel diameter is between about 100 and about 200 micrometers in diameter.

45. (Currently Amended) An apparatus comprising:

- a) a reaction chamber containing a template comprising an unknown nucleic acid molecule attached to an immobilization surface;
- b) an inlet channel in fluid communication with the reaction chamber;
- c) an outlet channel in fluid communication with the reaction chamber;
wherein the first and second channels are distinct and separate from the reaction chamber and positioned before and after the reaction chamber.
- d) a Raman detection unit operably coupled only to the outlet channel at a location outside the reaction chamber, wherein SERS active particles are in the outlet channel,

wherein the second Raman detection unit is configured to measure the concentrations of nucleotides by Raman spectroscopy at a location outside the reaction chamber as the nucleotides flow through the outlet channel;

wherein the Raman detection unit is distinct and separate from the reaction chamber and is positioned after the reaction chamber.

46. (Currently Amended) The apparatus of claim 45, wherein ~~each~~the Raman detection unit is capable of detecting at least one nucleotide at the single molecule level.

47. (Currently Amended) The apparatus of claim 45, wherein the concentrations of nucleotides is measured by Raman spectroscopy as ~~they~~the nucleotides flow through the ~~inlet channel and~~ outlet channel.

48. (Previously Presented) The apparatus of claim 45, wherein the inlet channel and outlet channel diameter is between about 100 and about 200 micrometers in diameter.

49. (Previously Presented) The apparatus of claim 18, wherein the reaction chamber further comprises a primer and a polymerase, and wherein the template, the primer and the polymerase are confined to the reaction chamber.

50. (Previously Presented) The apparatus of claim 36, wherein the reaction chamber further comprises a primer and a polymerase, and wherein the template, the primer and the polymerase are confined to the reaction chamber.

51. (Previously Presented) The apparatus of claim 41, wherein the reaction chamber further comprises a primer and a polymerase, and wherein the template, the primer and the polymerase are confined to the reaction chamber.

52. (Previously Presented) The apparatus of claim 45, wherein the reaction chamber further comprises a primer and a polymerase, and wherein the template, the primer and the polymerase are confined to the reaction chamber.